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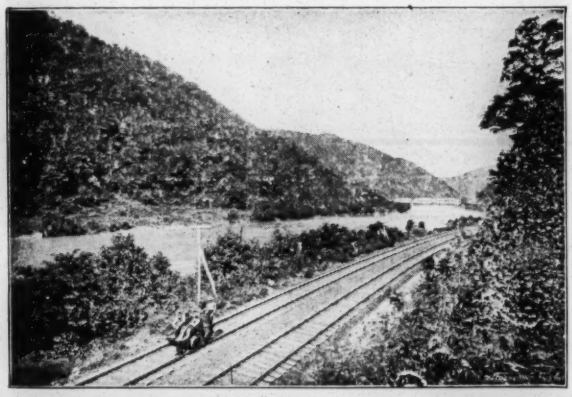

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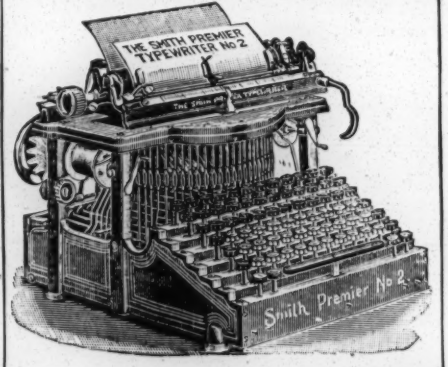

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THE
National Geographic Magazine

VOL. IX DECEMBER, 1898 NO. 12

THE FIVE CIVILIZED TRIBES AND THE SURVEY OF INDIAN TERRITORY *

By C. H. FITCH,

Topographer, U. S. Geological Survey, in Charge of Indian Territory Surveys

Mr Henry Gannett, Chief Geographer of the U. S. Geological Survey, presented to the readers of THE NATIONAL GEOGRAPHIC MAGAZINE in March, 1896, an article on the survey and subdivision of Indian Territory and the progress made in the survey up to the time of writing. Now that the survey has been completed, a summary of the work, with some remarks upon the present condition of affairs in the territory, may be of interest.

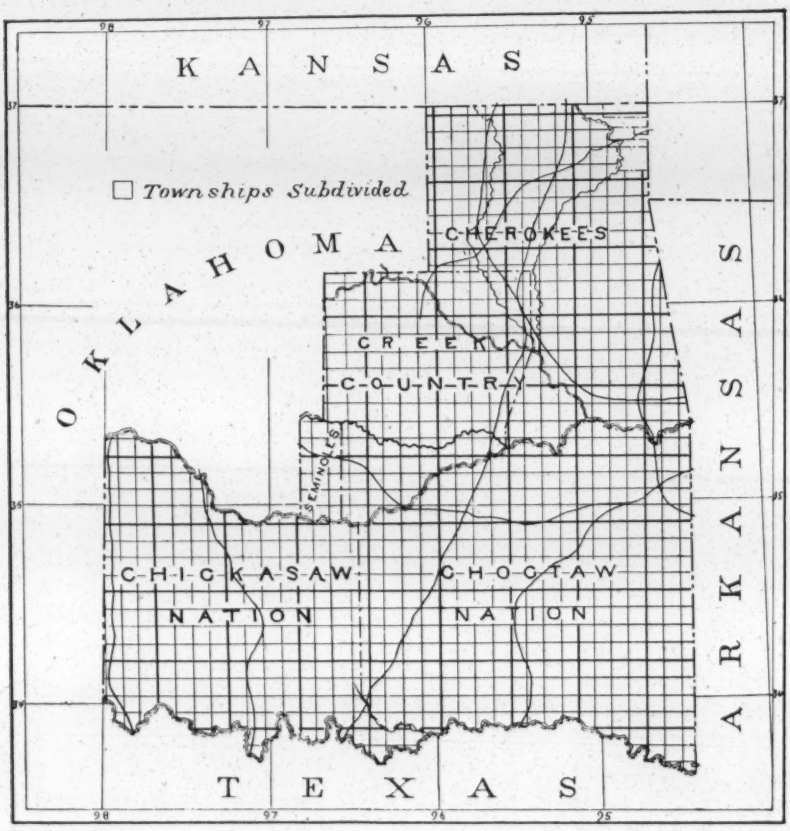
An impression prevails among many eastern people that Indian Territory is in the Cherokee strip, or is at least a part of Oklahoma, or somewhere in the remote west, and yet apparently much interest is being shown at this time in the condition of affairs in the country occupied by the Five Civilized Tribes.

Indian Territory lies between latitude 33° 30′ and 37° north and longitude 94° 30′ and 98° west. The lands held by the Five Civilized Tribes comprise nearly all the territory, and cover an area of about 31,000 square miles.

This territory, as well as that of Oklahoma, was originally granted to certain tribes in exchange for lands east of the Mississippi, which were demanded for settlement by whites. The Five Civilized Tribes consist of the Cherokee, Chickasaw, Choctaw, Creek, and Seminole nations, and they have been occupants of these lands since 1833, when their removal from the south-

* Presented at the Joint Session of the National Geographic Society and the A. A. A. S., Boston, August 25, 1898.

eastern states was effected. These Indians are self-sustaining, but large sums of money have been paid to them from time to time for lands purchased, and large sums are still held in trust for them by the general government. Each tribe or nation has an organized government on the general plan of the states, and they elect legislators to enact laws, and governors, judges, and other officials to enforce them. They are law-abiding, but the



full bloods are unprogressive, and most of them are opposed to any change in their tribal government. By law they are allowed to become citizens of the United States, but they have failed to avail themselves of this privilege.

There are about 50,000 Indians in the Five Civilized Tribes and about 18,000 negroes, who are Indian citizens. A large number of the Indians are quarter and half-breeds, and among them are many intelligent and educated men. To them and to

the white men who have gained a foothold whatever progress has been made is due. The white or non-citizen population is variously estimated at from 250,000 to 350,000, outnumbering the citizens by at least four to one.

There is a United States agent for the Five Civilized Tribes located at the Union agency at Muscogee, in the Creek Nation. All business of the Indians with the Department of the Interior is conducted through this agent. He has under his control the Indian police force, numbering some forty men.

There are three United States judicial districts and four judges who together constitute the U. S. court of appeals. The jurisdiction of these courts was at first limited to civil cases, the criminal business relating to non-citizens being tried in certain U. S. courts in Arkansas and Texas, but the courts of these States have at present no jurisdiction within the territory. A United States statute prohibits the introduction into the territory of any kind of intoxicating liquor, but the law is continually being violated, and at least one-half of all the indictments are against whiskey-peddlers for "introducing."

There is a general impression that the Indian Territory is an extensive prairie with very little timber within its limits. On the contrary, the major portion of the country is rugged and mountainous, covered with forests, which are principally oak. There are also some large forests of yellow pine, mainly in the southeastern section of the Choctaw Nation. In the same nation there is much black walnut timber, some of which is being shipped out of the territory. From Talihina, on the line of the "Frisco" road, in the Choctaw Nation, cedar is being shipped abroad for the manufacture of lead-pencils. In many localities sawmills are engaged in cutting pine.

Along the valleys of the Arkansas, North Fork, Canadian, Grand, and Verdigris rivers the soil is extremely rich and fertile, producing good crops of cotton, oats, wheat, etc. Elsewhere the soil is diversified, ranging from good, rich prairie land to stony hillsides, and a large proportion is practically worthless for agricultural purposes. On the rolling prairies in the Cherokee, Chickasaw, and small portions of the Choctaw nations a large quantity of wild hay is annually cut for the purpose of winter feeding to the cattle which range over these prairies. Great herds of cattle are brought from Texas to fatten before final shipment to market, and immense pastures are fenced in for their use. Some stock, including horses, mules, sheep, and

A STREET IN SOUTH MCALESTER, INDIAN TERRITORY, 1898

hogs, is raised in the territory, but no particular attention is paid to improving the breeds. The hogs are of the razor-back variety, and roam the woods, half wild, in search of food. The Indians live upon very little; fresh pork and a small quantity of corn raised for the preparation of "sofky" seem to be about all that many of them have. The woods may be full of deer, turkeys, and smaller game, but their existence is apparently ignored.

The carboniferous coal measures of Indian Territory probably underlie the eastern half of the territory, together with the western portion of the Creek country. The only development of coal that has been made is along the lines of the Missouri, Kansas and Texas and the Choctaw, Oklahoma and Gulf railroads. The coal so far developed is excellent for the production of steam, gas, and coke. The report of the U. S. Mine Inspector for Indian Territory shows that the output of coal for the year ending December 31, 1897, was 1,334,795 tons and the number of men employed in the mines 3,411. A considerable part of the revenue of the Choctaw Nation, in which these mines are situated, is derived from the coal leases.

The several governments of the Five Civilized Tribes derive an income from leased lands, licenses, and permits to non-citizens. All lands are held in common, and no Indian can be taxed for the land he occupies. No attention is paid to the improvement of roads, and there are no public bridges or ferries. Numerous towns, some of them of considerable size and importance, have sprung up along the seven railroad lines within the territory, but they are without legal existence and have no recognized town or city government. They are without proper officers to enforce laws, have no water supply or fire departments, sidewalks or other street improvements, no schools, except private ones, and no systems of drainage or sewerage. The title to town lots, if title it can be called, does not allow the purchaser to build a house and rent it; he must either sell or occupy, for if vacant it is liable to be "jumped." Only the Indian citizens have the privilege of renting houses and lots.

The question of the allotment of lands in severalty to the Five Civilized Tribes and the enactment of a townsite law has been agitated for several years. A commission composed of five members, commonly known as the Dawes Commission, was authorized by Congress, and has for a number of years been endeavoring to treat with the Indians with such allotment in view, but

INDIAN LIGHT-HORSEMEN ON A SCOUT FOR HORSE THIEVES

CAMP OF A U. S. G. S. SURVEYING PARTY, INDIAN TERRITORY, 1897

the Indians are slow to think and slow to act, and have persistently opposed any change in their tribal relations. Recently, however, some progress has been made in this direction, and agreements have been prepared and signed by representatives of certain of the tribes and the Dawes Commission. A bill providing for the protection of the people of Indian Territory, commonly called the Curtis bill, has recently become a law. Its most important provisions are for the allotment of lands in severalty to the Indians of the Five Civilized Tribes, and for the laying out of towns, leasing of coal lands, etc.

To allot the lands there must of necessity be a subdivisional survey. The only survey that had ever been made was that of several outboundaries of the nations, and the subdivision of the Chickasaw Nation, accomplished about twenty-five years ago. Under the provisions of an act of Congress approved March 2, 1895, an appropriation of $200,000 was made for the survey and subdivision of lands in the Indian Territory, under the rectangular system. The act referred to provided further that the Secretary of the Interior might in his discretion place the work under the supervision of the Director of the U. S. Geological Survey. Usually, surveys under the rectangular system are executed under contracts let by the surveyor general for the district in which the surveys are to be made. Where there is no surveyor general, as in this case, the contracts are awarded by the Commissioner of the General Land Office, with the approval of the Secretary of the Interior. The contracts are let at stipulated rates per linear mile, as fixed by law.

The Secretary of the Interior decided, under the authority granted by Congress, to place the work of the subdivision of the Territory in charge of the Director of the Geological Survey, and a plan of operations was drawn up by the latter officer and approved by the Secretary March 21, 1895. Immediate steps were taken to begin the work and by April 1 the first parties were in the field.

The force was increased as rapidly as was consistent with economy, until two parties were engaged in establishing the standard meridians and parallels at intervals of 24 miles; six parties were engaged in running township exteriors within the blocks bounded by standard lines; and four parties, each consisting of two camps with two surveyors or transitmen in each camp, were engaged upon the subdivision of townships. Each of the subdivision parties was placed under the control of a topographer of the permanent force of the Geological Survey, whose duty

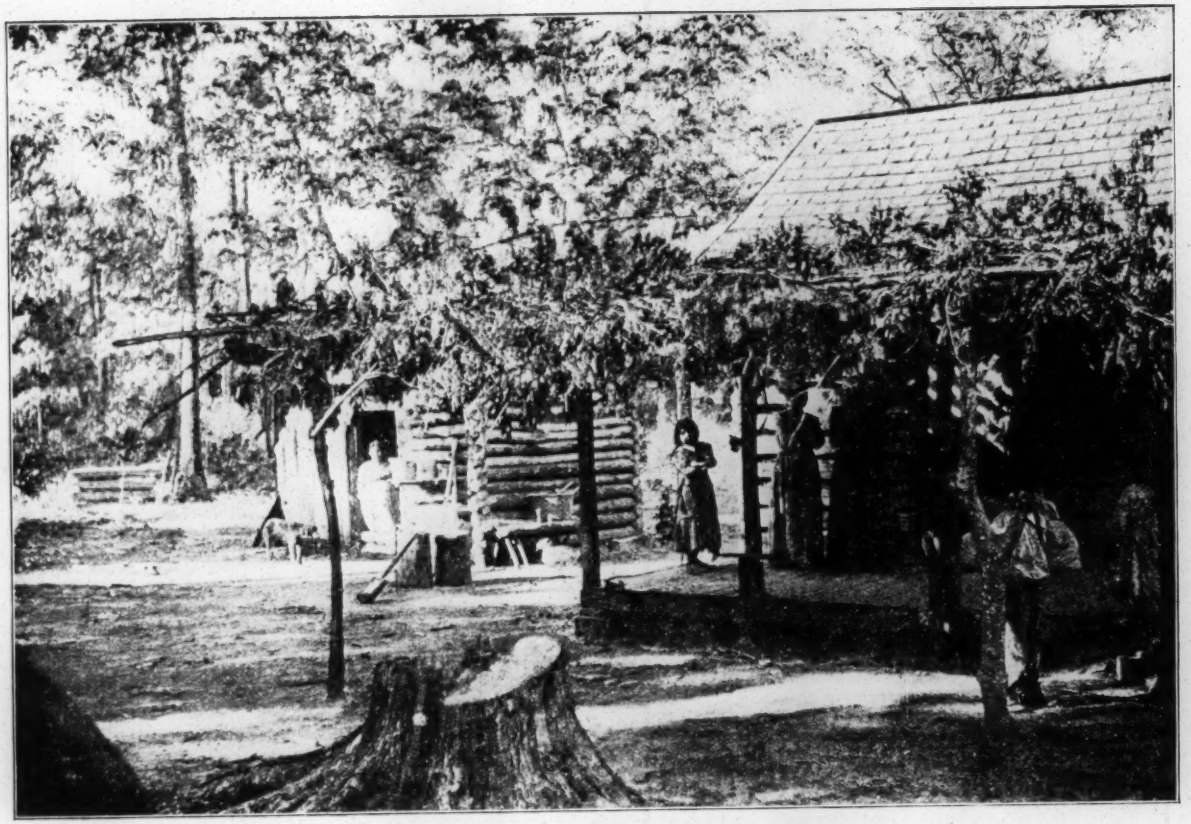
consisted in the inspection of the work of the land survey and the preparation of the topographic maps. With the commencement of surveys in the Chickasaw Nation the force was further increased. The field-work has been practically continuous, having been prosecuted throughout the heat of summer and the cold and storms of winter.

An additional appropriation of $200,000 was made by Congress in June, 1896, and in June, 1897, a further sum of $100,000 was appropriated. At the same time an appropriation of $141,500 was made for the resurvey of the Chickasaw Nation. In January, 1898, a further amount of $30,000 was appropriated to complete the survey of Indian Territory. The last appropriation was rendered necessary by the discontinuance of the survey in the spring of 1897 owing to lack of funds, and the reorganization and the long distances to be traveled after the appropriation was passed in June, 1897.

Under the provisions of the appropriation act of June, 1896, an iron post was required to be set at each township corner. These monuments are four inches in diameter, four feet long, and are set three feet in the ground. They have been placed at every township corner, including those established by the surveys executed prior to the enactment of the law. In addition to the usual marks referring to township, range, and section, the elevation above sea-level is marked upon the brass cap of such posts. The elevations are determined by means of spirit levels. Prior to beginning the work upon the township lines, double lines of levels were run over the tracks of the railroads traversing the country, with frequent bench-marks as checks to the township lines crossing them. The datum point for the level work is a bench-mark established at Fort Smith, Ark., by the U. S. Coast and Geodetic Survey.

A system of triangulation has been carried over the area surveyed, the base for which was measured near Savanna, on the line of the Missouri, Kansas and Texas railroad, in the Choctaw Nation. This triangulation is a basis for the topographic survey, and a means of checking and correcting errors, and will assist in the recovery of missing corners should they become lost or disappear in after years.

The topographers in charge of subdivision parties, with the aid of assistants, have mapped the topography of the area subdivided. They first plotted upon the field sheets the objects noted by the surveyor, including the crossing of streams, roads base and summits of hills, ridges, or mountains. The elevations



CHOCTAW CABINS, INDIAN TERRITORY

of the exterior lines were furnished by the levelmen, and additional elevations were obtained by means of vertical angles run through the interior of the township, checked upon the levels.

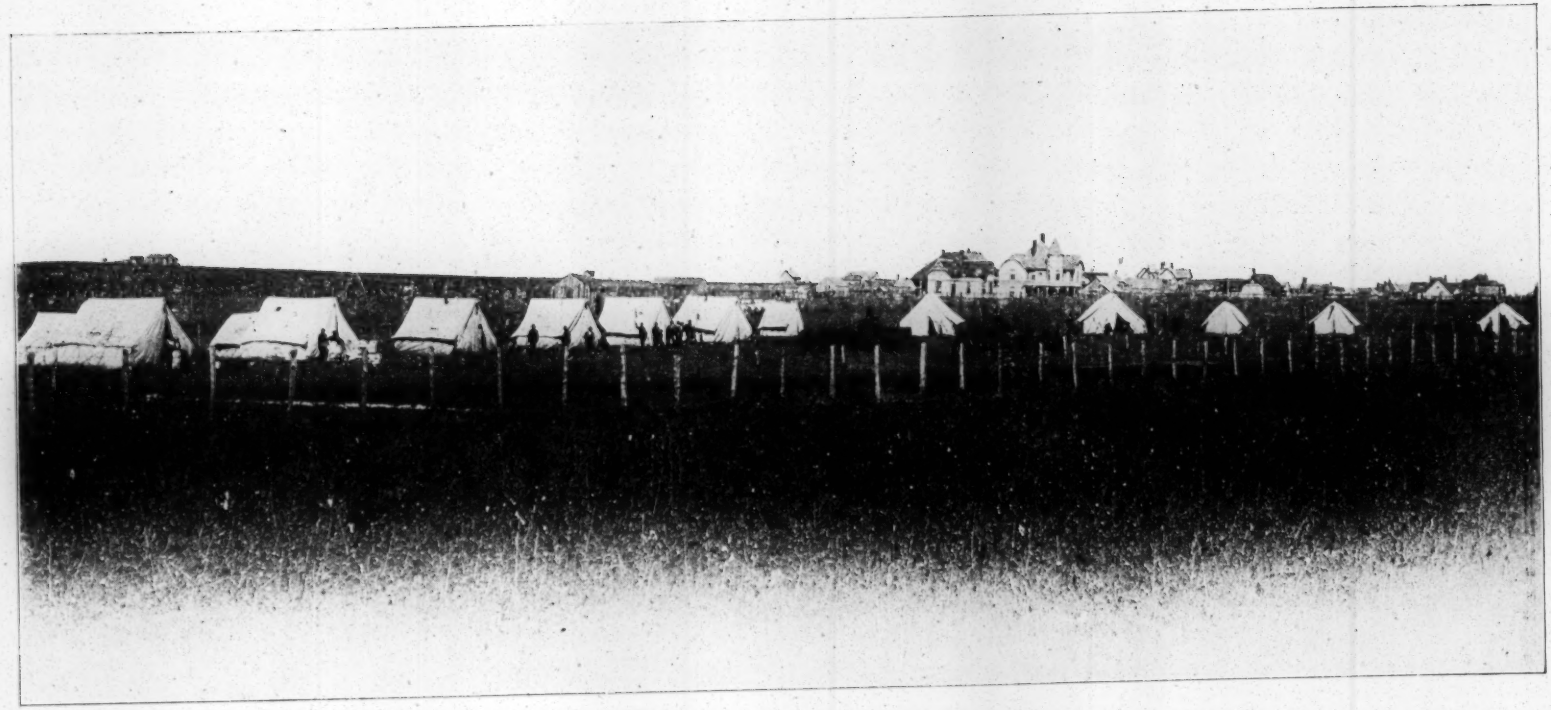
The progress made in the survey of the Indian Territory to the end of June, 1898, when the field-work was completed, is shown by the reports submitted to the Director of the Geological Survey. As appears from these reports, 138 triangulation stations have been established, from all of which angles have been observed.

In the land survey 63,881 miles have been run, as follows: Standard lines, 2,491 miles; exterior lines, 7,777 miles; subdivision lines, 50,931 miles; meander lines, 2,149 miles, and boundary lines reëstablished, 533 miles. In addition, level lines have been run as follows: Railroad levels, 1,613 miles; other level lines, 7,690 miles. Vertical angles have been run over 8,595 miles. The total mileage of the land survey, level and vertical angle lines, since the beginning of the work is 81,778.

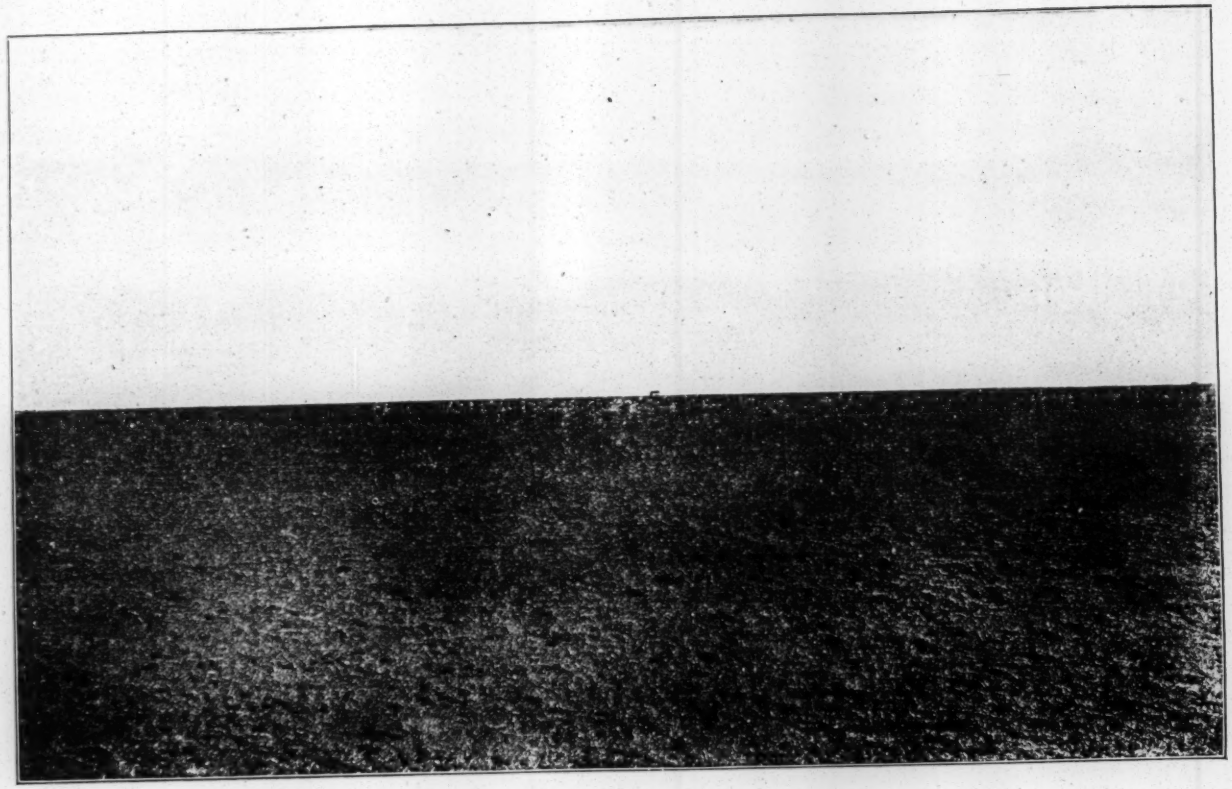
The Geological Survey has not only executed the land or subdivision survey of the area, but has in addition carried on the triangulation, the topographic survey, including many miles of spirit-level lines, and has also set the iron posts or bench-marks, a labor not required of contractors, and all this has been done at a great saving to the government from the amount which it would have cost under the contract system. There has been some trouble occasioned by the destruction of corners and bearing trees by Indians, but warnings from the Indian agent and from the several Indian governors abated this annoyance. No interference has been attempted by Indians with the surveyors in the field.

During the late summer and early fall months of the several seasons malarial fevers have been prevalent among the men, and at times have seriously interfered with the work. The summer of 1896 was remarkable for its intense heat, and the hottest part of the United States seemed to be that section included in the Indian Territory. Only one death from sunstroke occurred, however, and as a rule the health of the different parties and the immunity from accident of the 300 or more men employed have been remarkable.

The headquarters camp and office were located at South McAlester, in the Choctaw Nation until June, 1897, when, for convenience, they were transferred to Denison, Tex., near the border of the Chickasaw Nation. The work of preparing transcripts of field-notes, township plats, and topographic maps has progressed rapidly, but some of the office-work still remains to be completed.



CAMP OF A U. S. G. S. SURVEYING PARTY, NEAR ARDMORE, INDIAN TERRITORY, 1898



NORMAL APPEARANCE OF THE HIGH PLAINS

CLOUD SCENERY OF THE HIGH PLAINS*

By WILLARD D. JOHNSON,

U. S. Geological Survey

There is no scenery of the High Plains except that which once a year for a brief period the sky affords, and which then on a vast scale it builds upon them in clouds of extraordinary splendor, or lends to them in elaborate illusion of light and shadow.

Ordinarily, through nearly the entire annual round, there is no material for landscape effect, except the straight line of the horizon, with a featureless breadth of sun-faded brown below it and above a merely broader space of faded blue. There is nowhere a curving line, and though as a scientific fact there is vast extension of dead flat plain, there is little suggestion of it to the imagination when the sky is empty of clouds.

The horizon is, in fact, not distant, as seen from the ground. It is not so distant as that at sea, for normally it is viewed from an elevation much lower than the deck of a ship, and there is no lift of a wave at intervals to extend it. The ranchman gets a widened view from his windmill tower on oiling days, but his accustomed point of observation is the back of a horse. With his motion in the saddle, antelope, feeding along the sky-line, will have the deceptive appearance of moving vertically in unison, so responsive is that boundary of vision to vertical change in the position of the eye. The ranchman's wife views the world from the doorway, and hers is a still narrower horizon. And the small boy, as he soon learns, can step off the radius to his. He finds, moreover, that to do so is no great adventure. He lives in a pent-up Utica, but he has the measure of it. He discovers that he is tethered in effect to his windmill tower; that to put that familiar object hull down, and finally out of sight, is to go adrift. Beyond would be the open sea. Indeed, he has his foot at the edge of it when, on looking back, tiptoeing, he can but just discern the rim of the windmill wheel turning dark and solitary against the sky.

*The photographs from which the accompanying illustrations were made were taken by the author near Meade, southwestern Kansas, in June, 1897. A bichromate of potash ray filter was used, and isochromatic plates. The time of day was immediately after sunset. The direction faced was due south.

There are towns on the High Plains. At least there were towns in the days of the great "boom." Of some of these there now remain neither population nor buildings; others show a scattering of buildings, though empty ones, and in a few, among many empty buildings, is to be found a family here and there. These vestiges of boom creation have been merely waiting for something that has never happened, that never can happen—the blossoming of the desert. At one time across the interspaces the farmer swarmed, but he, too, now is gone, as a class. As in the towns, so on the great flats in between, of the flocks that once settled down and then took flight again a lingering representative is still to be found here and there; and he is waiting for a change of climate, for the farm on the High Plains is nothing more than a body of land surrounded by wire fence. It can never be anything else except as, in half a decade or so, sod finally heals the furrows of the futile plow and it goes back to prairie and to cattle.

The diversions of the people of the great uplands are altogether indoors. For those of the "towns" there is nowhere to go; beyond the sky-line there is nothing, only extended myriads of other empty acres and townships; and for the occasional farmer, except it be the oiling of his windmill, there is nothing to do. It is of no use to plant wheat that does not grow; that again and again in this fertile soil, through arid seasons of unanswered prayer, has refused to grow. To be sure, once in a decade, more or less, there will come a year of plenty—a year of general and comparatively abundant rainfall—as, for example, this present one of 1898, behind which the lean years in unbroken succession were just a dozen; but these exceptions are not answers to prayer; they are rather to be regarded as interpositions of the evil one and a trap.

The single diversion of the people of the High Plains is the dance. Mention of it here is not irrelevant. The dance of the upland plains country is properly to be regarded as a psychological phenomenon to which the mute emptiness of all outdoors is a compelling cause. It is not the celebration of an event, but is the event itself, and enlists the serious energies of old and young alike. It is spontaneously recurring—an impulsive getting together out of the void; and the impulse is as mysterious in origin, as swift and all-embracing, as a prairie fire. It is a galvanic, nervous reaction from the strain of monotony.

The High Plains are the central plains region, or, more accu-

CLOUD SCENERY OF THE HIGH PLAINS—OPENING DEMONSTRATIONS

From a photograph by Wil'ard D. Johnson

rately, they are a close assemblage, in north and south belt form, of low and broad plateaus within that central region. They are immense remnantal tables, in light relief, of an older and originally perfect plain, which a few long and feeble streams, wide apart, extending eastward from the distant mountains in parallel courses and without tributaries, have thus blocked out by dissection. Of the Great Plains area these midway plateaus of faint elevation constitute the only true plains—the plains proper.

The climate of the Great Plains slope has a range from humid in the east to arid in the west. Midway, therefore—a unit according to climate as it is a unit topographically—the High Plains subdivision is subhumid or semiarid. A subhumid climate may be defined as one to which drought is normal, the difference between a region of complete aridity—*i. e.*, a desert—and one of prevailing drought being that, while both are outside the boundaries of "God's country," the latter directly borders upon it, and periodically becomes the crowded lumber field for its atmospheric paraphernalia out of use, receiving therefrom for a time its accidental leakage.

And then the inhabitant gets out of doors. He stretches forth his arms and breathes in a modicum of the real joy of living, with the promise of moisture. He no longer sits stolid, just without his threshold, with back to the landscape. The house dog, too, takes up position at an unaccustomed distance and barks defiance to the multitudinous cry of the ventriloquist coyote; and the eldest son greases the wagon and the family go over the horizon to visit their neighbor.

The clouds come in with a gradual maturing at some point along the sky-line; and immediately that point recedes into infinite distance. Multitudes of fragments detach themselves, and radiate high over the great flats in drifting flocks of cirrus,

"Shepherded by the slow, unwilling wind,"

and come to rest as outposts. Then begin the heavy marshalings and for some days these continue. Ranches disappear in premature night under mere accumulation of shadow, and again are sought out in the glare of recessed furnaces of illumination and seemingly consumed. The plain is thundered over continuously, and penetrated at innumerable points by vertical lightning. Fires thus are sometimes originated, and areas as great as a New England state become blackened over with a film of grass char-

coal, which the later winds whirl into columns as much as a mile in height and trail along both plain and sky.

In this display there is grandeur in the magnitude of details and the deeply glowing colors, but there is no diffused coloring; there are no stratus clouds as yet; no lines of order. Soon, however, arise the winds, and slow evolution gives place to tumult. The solitary inhabitant, wherever the occasion may have found him, drops all pretense of occupation, and with hat gripped in both hands, leaning back against the rush of air, surrenders himself to awed contemplation of the spectacle.

Finally space is cleared. Around the circle of the immeasurably remote sky-line the lumber of atmospheric scenery becomes packed away in horizontal tiers and overtopping piles, and the great flats settle down to silence, except for a far marginal murmuring never entirely stilled. Then illusion comes forth, and over them maneuver beauties disembodied and immaterial. This is the desert equivalent of the eastern Indian summer. Though there is no color of autumn foliage, there is yet the effect of it, and toward evening, inaugurated by mild disturbances in atmospheric density, there is a marvelous lifting and stir over the vast stage as of a ballet color-play of flaunted draperies.

But the closing effects especially are stupendous, the coloring more lavish, the cumulus masses of incredible height and volume. They take their course swiftly to an end, and the magic goes out with a blink. A last thunderhead, reared in far retreat, glimmers and mutters from beyond the horizon. With its sinking the commonplace has abruptly returned. To the "short-grass country," to the interminable spread of level lands that "literally scream for water," the net result of these heavy labors will have been but a pattering of drops, with sudden and mighty downpours over abandoned and forgotten townships here and there, many miles apart, and an ephemeral carpeting of green, but no continued soaking, no "gray veils of rain."

And yet the High Plains have a future. The "boomers" were birds of passage; another population with different ideas will come to stay. The windmills then will largely multiply, but the newcomers will not be farmers, and it will not be for irrigation that the meager leakage from the clouds which had soaked into the ground will be pumped out again. The most effective utilization of that scant supply will be recognized as secured when, toward evening, along radial trails in all directions extending out to the horizon, cattle are seen, in long lines, coming in to water.

CLOUD SCENERY OF THE HIGH PLAINS—THE CLOSING SCENE

From a photograph by Willard D. Johnson

ATLANTIC COAST TIDES*

By Mark S. W. Jefferson

The tides of the eastern American coast are oscillations of the shallow waters on the continental shelf communicated from the swaying ocean beyond.

The area must be subdivided into the coast proper, facing the open waters of the shelf, and the shallow basins included behind islands and banks.

The continental shelf is a submerged platform along our shores, sloping so gently that it would appear flat to the eye if it were a land surface, and margined eastward by the line of 100 fathoms soundings.

From Long island northward a line of banks rear their summits to within 30 fathoms of the surface along the eastern margin of the shelf, with deeper waters between them and the land. Between these banks, however, are numerous deeper openings, through which tidal movements are communicated landward as well as over the shallow banks.

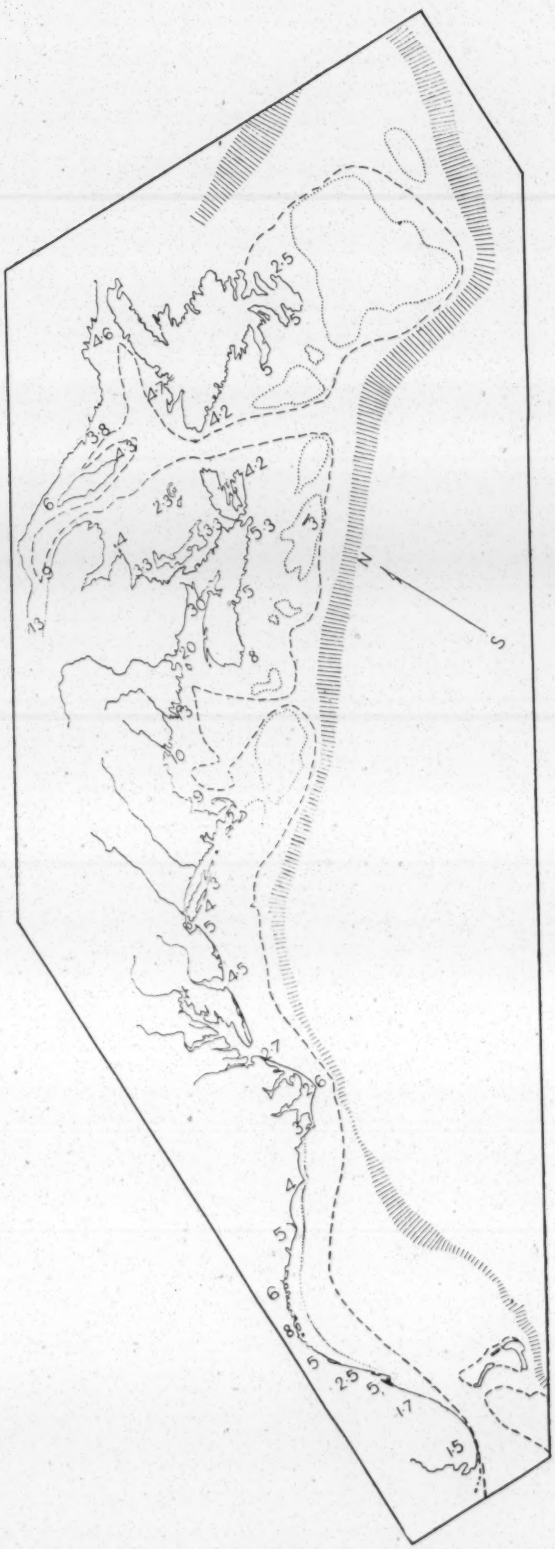
Southward from Long island the descent of the shelf is beach-like and uninterrupted from the shore to the line of 100 fathoms. Only in the waters east of southern Florida do the Bahamas come in to interrupt the descent to the ocean depths. This general configuration is shown on the accompanying sketch (see p. 498), where a broken line represents the 100-fathom line and the approximate boundary of the continental shelf, the dotted lines inclose the banks, and the band of shading indicates the steep slope to depths of 2,000 fathoms. Numbers indicate tide ranges. The northern half of the shelf is seen to be wider than the southern, besides being distinguished by the line of banks.

Within this area lie the inclosed basins—Long Island sound, the Gulf of Maine, and the Gulf of St Lawrence. They increase in depth and size from south to north.

TIDES ON THE COAST PROPER

An examination of the whole coast line shows an intimate relation between time and range of tide and the form of cross-section of the continental shelf off each station. In a few cases

* Extract from Thesis in research course in Geography at Harvard University.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it is difficult to decide in what direction the cross-section should be drawn, but in general an east-west line gives satisfactory results, besides according well with the general conception of the Atlantic tidal oscillation. But it is certain that the tidal impulse is not limited closely to transmission in one direction. The tidal range appears to vary with the width of the continental shelf where the descent to the sea is unbroken; where shoals stand on the shelf margin the range is thereby diminished, being greatest opposite the openings between the shoals.

The general tide relations on the coast are as follows:

In the north, in the Nova Scotia-Newfoundland area, the line of 100 fathoms is about 200 miles offshore, if measured on an east-west line. A series of banks lies just within this line, while close without the descent is rapid to 2,000 fathoms. The tide-ranges are from 4½ to 7 feet.

In the Middle bay, from Nantucket to Hatteras, 100 fathoms and the descent to oceanic depths are alike some 70 miles out. Tides range from 2 to 4 feet.

In the Southern bay the 100-fathom line is 30 to 80 miles from land, while the descent to 2,000 fathoms lies 240 miles out. Tide-ranges are here from 4 to 8 feet.

THE NORTHERN AREA

The tide reaches shore first at Country harbor, well up toward the Gut of Canso, and due west from the deep entrance to the Gulf of St Lawrence. Thirty minutes later it has reached the southwest end of Nova Scotia and the northeast end of Cape Breton island. After another half hour it reaches the south coast of Newfoundland.

The tidal impulse seems to enter these waters by the entrance to the St Lawrence, the Banks of Newfoundland barring off the ocean to the east. If this be true, it is here transmitted along a southeast-northwest line. That this is so is confirmed by the fact that the tide reaches the south side of Sable island an hour before it appears on the north side. Sable island stands close to the eastern margin of the shelf, southeast from Country harbor. The smaller ranges occur on the south coast of Newfoundland, where the tide has only indirect access to shore.

MIDDLE BAY TIDES

The Middle bay lies in a 120° angle of the coast, with vertex at Sandy Hook and the sides resting on Nantucket and Hatteras

respectively. The continental shelf in this bay is widest off Sandy Hook, where it is channeled across by the submerged valley of the Hudson. Tidal ranges increase from about 2 feet at Nantucket and Hatteras to more than 4 feet at points on the Jersey shore and at Sandy Hook.

The extreme difference of times throughout the bay is about an hour, the distribution being somewhat irregular. There are three points of early, almost simultaneous, high water—

No Mans Land, near Marthas Vineyard;
Fire Island inlet, on the south coast of Long island;
Cape Hatteras.

At four other points high water arrives almost simultaneously an hour later:

Nantucket, south shore;
Montauk point, entrance to Long Island sound;
Delaware Bay entrance;
Chesapeake Bay entrance.

Between these points there is a good progression of times from early to late. It will be noticed that the entrance to New York bay is not a late point, like the Delaware and Chesapeake entrances, yet there is some delay from Fire island to Sandy Hook. In general, the time differences are of a magnitude perfectly explicable by variations of depth and shore configuration. The expectation that weak tides should early reach the headlands, Nantucket and Hatteras, and progress thence toward the bay head is not realized, save for amplitudes. The times are as early within as at the bay headlands. The amplitudes do increase up the bay.

This portion of the American shore is nearest to the swaying ocean, with its ebb and flood currents alternating along the shore. The characteristic of the coast-line is longshore transportation, cut headlands, and long beaches and bars, to which the soft material of the coast readily lends itself. The only considerable interruptions in the continuous beaches from Montauk point to Hatteras are at the remoter portions. These openings are aided at New York and New Jersey by the stronger tides, and at the Chesapeake by the outflowing waters of the northern half of the Appalachians.

SOUTHERN BAY TIDES

The shores here have three types—the cuspated capes in Carolina, the Georgia entrances, and the Florida sand bars. The tide-

ranges are roughly proportional to the distance from the 100-fathom line. The tide reaches Hatteras about the same time as the general northern coast. The range is there 3.6 feet and the escarpment 30 miles away. As far south as Savannah entrance distances from the 100-fathom line increase steadily, the range mounts up to 7 feet, and the tide is an hour later. The line is here 80 miles distant. From this point southward the line draws in toward the coast, the ranges diminish, and the delay increases, as the tide-impulse is now transmitted down the coast, the Bahamas barring off the ocean to the eastward. At Canaveral configuration of shallows heaps up the range to 5 feet, but this is local only. The coastline has analogies in the matter of longshore carriage to the middle bay. At the bay-head the greater tides break the continuity of the sand bars and play in and out by innumerable channels.

THE BASIN TIDES

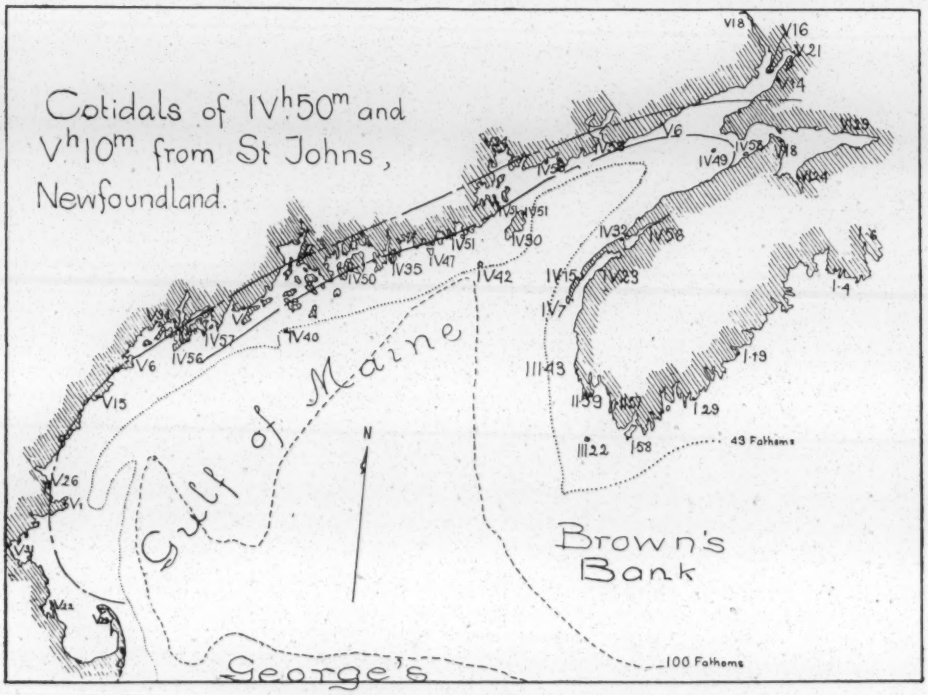
Long Island sound, the Gulf of Maine, and the Gulf of St Lawrence have their tides respectively 4, 3, and 2 hours after the open coast tides. This delay and a simultaneity of high tide for at least a part of their area constitute their common tidal features.

GULF OF MAINE TIDES

The Gulf of Maine, according to the usage of our Coast Survey, includes the waters of the New England coast from Monomoy to Cape Sable, Nova Scotia. Its basin is partially barred to the south by the Nantucket and Georges shoals, to the east by Browns bank. On these shoals soundings of 30 to 40 fathoms prevail. Between Browns and the Georges is a 16-mile wide channel across the continental shelf, connecting the ocean with the deep gulf center. Here, over an area measuring perhaps a third that of the whole gulf, soundings range from 100 fathoms to near 200. About two-thirds the area is in more than 43 fathoms. The continental escarpment lies 200 miles from the Maine coast, but the shelf is interrupted by the Gulf of Maine and margins around it. The shoals to the east and south have been well named by Mr Mitchell the Sill. To the north the Bay of Fundy extends from the deep area of the Gulf to Cape d'Or, Nova Scotia; to the southward lie Massachusetts bay and Cape Cod bay, all on the continental shelf.

The Maine coast opposite the deep area is deeply and minutely

dissected. For each of the 159 tidal stations in this area the lunitidal intervals have been taken from the tide tables of the U. S. Coast Survey, and referred to the time of high water at St Johns, Newfoundland. The datum resulting is the mean solar time interval between high water at St Johns and local high water. It is corrected for difference of longitude and the moon's motion. It differs from a cotidal hour such as Whewell used in being referred to another station than Greenwich and by



being expressed in mean solar instead of lunar time. All the stations have been examined, and on the American coast, where stations are very numerous, a few have been selected that agree well with those in their neighborhood. These, with all the stations on the New Brunswick and Nova Scotia coasts, appear on the accompanying map.

On looking over the mean tidal ranges throughout the gulf, we observe that this is the area of greatest tides of our whole coast, ranges of 10 or 12 feet prevailing. The least range on the mainland is about 8 feet, near Newburyport, increasing south-

ward to nearly 11 feet in Cape Cod bay, and northward to about 15 feet at the entrance to the Bay of Fundy. On the coast of Nova Scotia there is a similar increase northward from the 7-foot tide of Cape Sable. Up the Bay of Fundy the increase in tidal range is rapid and parallel on the two shores—*i. e.*, a line at right angles to the axis of the bay connects points of equal range. At the head of the bay the range is about 30 feet, and thence it rapidly increases in the narrowing channels to 41 feet at Monckton, on the Chignecto river, and 43⅓ feet in the Basin of Minas.*

On examination of the times, it appears that high water reaches the coast almost simultaneously from Cape Cod to the head of the Bay of Fundy. Lines are sketched on the map through places with the intervals IV h. 50 m. and V h. 10 m. to illustrate this fact. These intervals are chosen because they are means of a considerable number of stations and can therefore be drawn with some confidence. Of particular value is the IV h. 50 m. line, closely determined on the Maine coast, on Grand Manan, and at two stations in New Brunswick. Across the Bay of Fundy, at its head, the island stations of Isle Haute, IV h. 49 m., and Black Rock, IV h. 58 m., fix the position of the line equally well. That it cannot flex far to southwest before going ashore is indicated by the spacing of the intervals along the Nova Scotia coast. Annapolis must not be used for this purpose, as it has a delayed bay-head tide.

If the tide-wave advances on a line at right angles to its front, we expect to find its front at right angles to the bay axis—that is, northwest-southeast. It appears that the wave does not advance up the Bay of Fundy because, drawing the IV h. 50 m. line with the utmost partiality to such a view, the greater part of its length in the Bay of Fundy trends northeast-southwest. In other words, the southern half of Nova Scotia seems to have almost no effect on the direction of the wave advance—or front, at any rate—in the Bay of Fundy. Either the wave advances from southeast to northwest, which is not here supposable, or the tide in the main bay is not a progressive wave at all.

The cotidals are drawn on the assumption of a progressive wave. The result is the *reductio ad absurdum* of that assumption. The analysis of Mr Henry Mitchell† is in brief as follows:

* These are *mean ranges*.

† Physical Hydrography of the Coast of Maine, 1879. Ann. Rep. U. S. Coast Survey, p. 175.

(1) High tide occurs at about the same time from Labrador to Florida, except in the Gulf of Maine, where it is three and a half hours later.

(2) A flood-current to southwest appears simultaneously along the whole outer coast preceding high water, which is followed by a general ebb-current to northeast; also appearing simultaneously along the whole coast.

(3) Soon after high water outside, which is a time of level within the gulf, a current sets strongly to N. N.W. over the Sill into the Gulf of Maine and the water rises within the gulf. "An impulse observed at one of our current stations is almost immediately followed by a vertical change on the most distant shore." The current continues to flow thus *uphill* until high water in the gulf, when it slacks and turns. Three hours later it is flowing out with maximum strength, the gulf is level, and low water is established outside. While the water rises outside and the general flood-current of the coast sets to southwest, the gulf current continues to flow out over the Sill, again *uphill*, until three hours before high water without, when low water prevails in the gulf.

(4) The water bodies move from top to bottom. A diver on the coast of Maine observed distinct motion in 23 fathoms.*

Conclusion.—The Gulf of Maine and Bay of Fundy offer a "dead angle" to the general flood-current to southwest, while the ebb-current finds in it "a pocket into which the waters are crowded and, by virtue of their *vis viva*, piled up in the Bay of Fundy." After comparing with a fluid oscillating in a bent tube with two arms of very unequal size and inclination, the author suggests that the Bay of Fundy tides are a result of a rocking of the ocean into a contracting flume.

Mr Mitchell regards the Sill as a node and the oscillations in the Gulf of Maine as produced by the periodic impulse of the North Atlantic oscillation. It is not clear why there is no tendency toward "pocketing" the flood-current in Cape Cod bay. There also seems to be a difficulty with the period by which the gulf tides follow those of the outer shore. If there is a node on the Sill, and that the only node, the tides without and within should differ in time by six hours. From Mr Mitchell's explanation of the Gulf of Maine tides, however, he evidently does not mean by node here what is usually meant by the word.

* P. 176.

His study is important for its actual detection of oscillatory slopes in the gulf, its notice of synchronism of tides and currents in each of the two areas, and its frank abandonment of the progressive wave.

A more satisfactory reason for the delay in the Gulf of Maine tides may perhaps be found in the insistence on the east-west direction of the ocean oscillation that originates the shore tides. The deep entrance to the gulf is about 200 miles from shore on a northwest-southeast line. An east-west cross-section on the shelf in latitude 43° measures more than 400 miles, reaching the steep descent from the shelf a little south of the Sable Island bank. Supposing the earliest impulse to enter the Gulf of Maine be that by the deep channel, this must be followed and augmented by the progressive waves across the bench, and later by those that have come across the shallower banks. Such an impulse would need to be a bodily transfer of the water-mass; observed currents are not incompatible with the idea, a northward deflection of all water entering the gulf being brought about by the gradient into the Bay of Fundy.

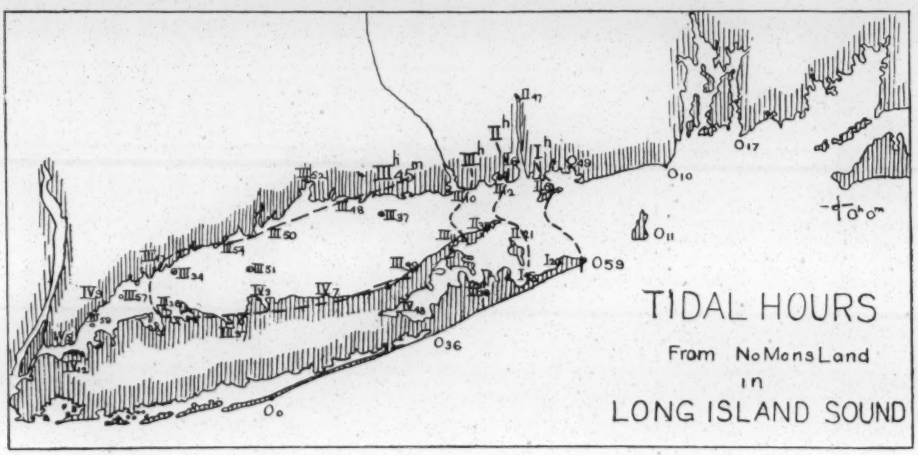
It is interesting that true nodal oscillations have been detected in the Bay of Fundy by Mr A. W. Duff.* He finds an oscillation of the waters between St John, N. B., and Digby Gut (?) in three segments and a period of 42 minutes, according well with the depth and width of the section and having the northwest-southeast direction indicated by our cotidal wave-front. A similar oscillation of much shorter period is noted in the mouth of the St John river. The free oscillation period of the Gulf of Maine, however, would be much less than the observed one of a half lunar day. The only tenable conception of the Gulf of Maine tides as oscillations with a node on the Sill requires that the whole ocean from the Sill to Europe form the outer segment to the gulf waters, and this, of course, requires the gulf times to agree with general coast times.

LONG ISLAND SOUND TIDES

No application of Mr Mitchell's analysis to the tides of Long Island sound is possible, as the tide unquestionably enters on the east; yet the tide is certainly more belated here than in the Gulf of Maine, and shows a close analogy to the *fluming* observed in the Bay of Fundy. What happens in the entrance to the basin is better known here, since the passage is a narrow one,

*Am. Journal of Science, 1897, p. 406.

with tidal stations on either hand and even on islands out in the channel. This entrance to the sound has a depth of 30 fathoms. The deep axis of the sound lies near the southern shore in 15 to 20 fathoms, with a constant gentle rise to the north. The main water body clearly oscillates en masse. This is evident from the synchronism of tides throughout the sound. It seems equally clear that the impulse comes from the outer coast as a progressive wave, perhaps combined with a massive movement, which consumes two hours in advancing through the 10-mile entrance. In this reach of slow progression the ranges are naturally slight, and there is little gain, but the narrowing and shoaling of the western end of the sound causes the tide to augment its range



rapidly in that direction from 2 to 7.2 feet. This is accompanied by a gentle steepening of the wave front, and is the natural result of bodily fluming the water into a narrow, shallow bay head, whatever the driving force, as we shall see presently.

For the times it is striking that from No Mans Land to Block island there should be a difference of but 11 minutes, while the far shorter distance to Montauk point consumes three-quarters of an hour. Some light may be had by referring again to the east-west line of the oceanic oscillation. The nearest deep water to Montauk point, Block island, and No Mans Land is some 70 miles to the south. From this point, though at right angles to the direct line of the motion, the earliest tidal impulse would probably arrive, and the indications of early time at No Mans Land and Block island result. This would not, however, prevent

the transmission of the direct impulse across the Georges and Nantucket shoals, nearly 250 miles in an easterly direction. This impulse would be faint and retarded by the long journey across the shoals. Reaching the islands in comparatively open water, the effect will be there to check the falling tide in its descent. At Montauk point, however, where the waters are confined and the range is small, the eastern tide may overtake the local tide soon after its greatest height and make highest water come later than the local tide would have come. We must think of a massive westward motion of the water here rather than of a progressive wave or in addition to it. The accompanying diagram (see p. 506) shows a number of tidal stations with their times and such cotidals as can be drawn 1 h., 2 h., 3 h., and 3 h. 45 m. No Mans Land is marked with a heavy cross.

GULF OF ST LAWRENCE TIDES

The tidal data for this area are not so numerous as is desirable. Like the basins described above, the deep connection with the ocean is by a channel much inclined to the direction of ocean movement. Here the axis of the broad entrance trends about northwest-southeast. Impulses across the shelf by the Grand and St Pierre banks must enter the gulf later, and may produce the delay in high water, as before.

The tides range about four feet in amplitude at the gulf entrances and swash out flatter in the wide space within. Throughout the deep area between Anticosti, Labrador, and Newfoundland high water is fairly simultaneous, about two hours after the outer coast tide. In the shallower southwest corner of the gulf a tide wave progresses from the deep channel near Anticosti along the New Brunswick coast to Prince Edward island, on which it divides, passing both north and south of the island and presently meeting tides that come westward from the Cape Breton entrance and the Gut of Canso. Ranges of three or four feet prevail save in narrow passages. The meeting of the tides marked on the north and south of Prince Edward island on the charts is a meeting of *currents*, and in the whole southwest area there is a steady progression not only of the point of high water, but also of the currents.

All the tide-waves in the southwest rise in 25 minutes' less time than they spend in falling. This is found typical of progressive waves in shallow waters. We call such waves steep fronted and find their extreme case among tides in bores, and in ordinary

short waves in the surf of the beach, with quick straight uprise of water in front and long gentle slope behind. In the northeast, as in the shelf waters generally, rise and fall are of equal duration.

BAY OF FUNDY TIDES

A brief note follows on a region geographically intermediate between the estuaries and the shelf basins.

These are of a special character, as was implied in the discussion of the Gulf of Maine. It is not a typical estuary. The fact that its area is almost coextensive with the soft Triassic sandstones that appear in patches all about its shores, together with the fact that it is now rapidly cutting these remnants away, is perfectly compatible with the former existence of Triassic rocks through most of the area with an axial valley, narrower and more typical in form, through which the Petitcodiac, St John, and St Croix poured their waters into the Gulf of Maine. Given such conditions, the rushing tides resulting from the massive oscillation of the gulf waters into the estuary must have tended toward the present conditions.*

A good description of the Fundy tides is still lacking. The greatest mean range is of 43.5 feet in the Basin of Minas, 50 feet at mean springs. Favoring meteorological conditions may increase this by nearly one-half on rare occasions, so that a 70-foot tide is not incredible. It is found that narrowing bays multiply an accidental or non-lunar disturbance of water level in the same proportion that they do the tidal oscillation. Thus Geneva is situated at the head of a narrowing shoaling arm of the Lake of Geneva, perfectly comparable to the Bay of Fundy, with but a sixteenth the water volume of the whole lake. The seiches or swaying oscillations of the whole lake produce a wave two or three times as great at Geneva as at points anywhere in the main lake, for large oscillations or for small.†

Similarly, barometric disturbances over the Gulf of St Lawrence that cause only a slight change in the small local tide add six or seven feet to the 17-foot Quebec tide.‡ During a storm which raged in Chesapeake bay in September, 1876, the water rose four feet two inches above mean high-tide level at Alexan-

*Similarly Delaware bay is believed to have been widened by the tide, though longshore action in the shallows outside is continuously striving to dam it off from the sea.

†Forel, Le Léman, vol. ii, Seiches.

‡30 Jan., 1894, and 8 Feb., 1855. W. Bell. Dawson, Royal Soc. Can., 1895, vol. i, p. 26.

dria.* Mean spring range at Alexandria is but 3 feet. So a "storm rise" of four feet on the open coast was 8 feet at Hell Gate.† During the gauging of East river "a moderate northeast wind" heaped up the western end of Long Island sound nearly a half foot above the harbor on one occasion. It is just as easy for "weather" to add 20 feet to the tidal rise in the Basin of Minas as 5 feet at Lynn, Mass. (Jan. 23, 1898), where spring range is but 11 feet.

A bore apparently exists in both Chignecto bay and the Minas basin, where it has been described as coming in in two lines. To judge from photographs, the bore is but a few feet high. Details about it are not given.

A well-established feature of these tides is the extraordinary amounts of sediment deposited at the estuary heads. In a hollow iron cylinder at Windsor, Murphy ‡ measured 30 inches of fine sand and mud deposited from the tides in 122 days, being uncovered at low water. W. L. Goodwin ⁋ states that thousands of acres of bogland have thus been built up by the tide in Westmoreland county, N. B. A lake 15 feet deep in 1867 was kept in communication with the bay by a canal that the tides might have free access. In 1892 it was quite filled and yielding hay. In Sackville county 3,000 acres have been reclaimed. Mr Goodwin seems to refer the origin of the mud in the water to the wearing of the rushing tides on the soft shales. Dr R. T. Jackson states that this is very marked at Joggins, N. S.

The steepening of the wave-front is inconsiderable and an advance of high water as a progressive wave hardly exists where our observations are distributed.

PRESIDENT ALEXANDER GRAHAM BELL ON JAPAN

The President of the National Geographic Society, Dr Alexander Graham Bell, is now in Japan, where he has been received with distinguished honors. On October 22 he was presented to the Emperor in special audience, and on October 29 to the Empress by special command. On November 6 he was entertained at dinner at the Imperial hotel, Tokyo, by the International Journalists' Association, as a tribute equally to his illustrious

* U. S. Coast Surv. Ann. Rep., 1878, p. 24.
† U. S. Coast Surv. Ann. Rep., 1886, p. 431.
‡ Nova Scotian Institute, vol. vii, p. 51.
⁋ Can. Record of Science, 1897, p. 364.

scientific career and his philanthropic work in behalf of the deaf and dumb. The proceedings are reported at great length in the *Japan Daily Mail* of November 8, and the following abstract of the interesting address delivered by Dr Bell in responding to the toast of his health is taken from the report in that journal. Beginning with a graceful acknowledgment of the honor of which he was that evening the recipient and an expression of the pleasure he had derived from his long-looked-forward-to visit to that marvelously progressive country, Dr Bell proceeded as follows:

Hundreds of years have passed since Columbus, sailing westward, discovered the land of the setting sun, and now we, looking seaward from that land, see a new light upon the horizon, and ask ourselves what is this strange effulgence, what is this novel luminary which begins to glow in the firmament? That question has been present in our thoughts for several years, and it is with no small satisfaction that I find myself able to see your country more closely, and to observe the conditions that give such earnest of a great future. An eminent man of science in America, Professor Marsh, recently delivered a lecture on the teachings of geology, and pointed out a very interesting fact. He said that on examining the fauna of successive geological strata, a series of progressions was distinctly visible. Thus the crocodile of one stratum was found to have a smaller brain than the crocodile of the immediately superior stratum, and the latter a smaller brain than the crocodile of the next stratum, and so on. The same rule seems to apply to human beings. If we look back to the pit-dwellers of primeval times we find a brain cavity perceptibly smaller than that of man in later eras, and it may be confidently said that the progress of the growth continues even to our own time. Well, gentlemen, Professor Marsh concluded his lecture with a remarkable statement. It was contained in a single, short sentence, but it was a very pregnant sentence. He said, "It is worthy of note that the brain of the average Japanese is larger than the brain of the average European." I do not pause to draw any inferences, but I quote the fact as something of which you may be proud—something which your recent history seems to illustrate. Small in stature, if you like, but large in brain; and during my travels through your country I have been struck by the fact that nature seems to have prepared for you a great and prosperous career. Everywhere I see long ranges of lofty mountains with comparatively narrow planes lying between their feet and the coast line. That indicates a grand gift. It indicates that your country should be the very home of electrical enterprise, for such a geographical formation shows that water power is available everywhere throughout the lowlands; that reservoirs of force convertible into electric power can be formed at points within easy reach of all your centers of commerce and industry, so that you are in the happy position of being able to base the economy of your country on electricity; to drive your vehicles with electricity; to substitute electricity for steam; to carry on your manufacturing enterprises by the agency of electricity. One cannot exaggerate the value of this boon which nature has conferred

on you, and that you will one day utilize it fully may be confidently inferred, I think, from the story of your progress during the past twenty-five years. I am particularly interested in observing that you appreciate the great truth which we in the West have come to recognize: the truth that education is the basis of progress and prosperity. Educate the masses, elevate their standard of intelligence, and you will certainly have a successful nation. That is what we tell ourselves, and the latest reports of your department of education show that it is what you tell yourselves also, for I learn from the reports, if my memory serves me, that no less than 64 per cent of your school-age children throughout the empire are receiving education, and that, in the case of male children, the percentage is as much as 79. Those are highly creditable figures, and they may be accepted as evidence that your progress stands on a really sound basis. But I do not find things equally satisfactory throughout the whole field of education, for whereas 64 per cent of your healthy children are receiving instruction, only 3 per cent of your deaf and dumb are similarly fortunate. Your educational statistics show that among your children of school-going age there are no less than four thousand afflicted with the calamity of deafness. How many of them are receiving education? Only a hundred and twenty. Think of what that means. I do not speak much of the blind. With them I have not had much to do. Their calamity seems too terrible. It necessarily limits the range of possible effort on their behalf. But the deaf and dumb appeal to our sympathy all the more strongly, inasmuch as we can do much to assist them. It is generally supposed that dumbness indicates some radical defect of the vocal organs. In the vast majority of cases such a supposition is entirely mistaken. Dumbness comes from the fact that a child is born deaf, and that it consequently never learns how to articulate, for it is by the medium of hearing that such instruction is acquired. Put a Japanese child in America, and you find that it easily and without any apparent effort learns to speak English. Put an American child in Japan, and you will soon hear it speaking Japanese. The whole source of trouble, then, is that the ears of these unfortunates are closed. Their brains, their minds, are as fully developed or as capable of development as yours or mine. Imagine the horror of being shut off from the intellectual world that surrounds you, debarred from all intercourse with your fellow-creatures, though all your faculties with a solitary exception entitle you to take your place in that world and enjoy that intercourse. I am proud to think that we in America have recognized these facts and acted upon them. The money devoted in America to the education of the deaf and dumb is two million dollars annually, four million *yen*—nearly as much as the total sum spent out of the public funds for all educational purposes in Japan. We have forty thousand deaf mutes in the United States, and we have upward of eighty schools, with an attendance of about ten thousand pupils. In the city of Philadelphia there is a school whose buildings and other property are valued at a million dollars, or two million *yen*. You in Japan must have about twenty-five thousand deaf mutes in the empire, and yet you have only two schools for their education, one in Kyoto and one in Tokyo. That is indeed a state of affairs that calls for remedy. Besides, this is

not a mere question of humanity; it is also an economic question. With proper education the deaf and dumb can be fitted for almost any walk in life. All the range of intellectual achievement is open to them. They can become authors; they can become painters; they can become journalists; they can discharge a number of valuable and wealth-earning functions. There are actually forty newspapers and periodicals in the United States written and edited by deaf mutes, chiefly for the use of their fellow-unfortunates. We spend four million *yen* annually upon the education of our deaf and dumb, but we find that their contributions to the wealth of the country after they are educated exceed that amount, so that, instead of being a burden to the state, they become a factor of prosperity. You see what interest this problem has from every point of view, and you will agree with me, I am sure, that what Japan is doing is sadly inadequate, and that, instead of only two schools in the whole empire, you should have at least a school in every province, as we have schools in every State of America. You of the press are the eyes and ears of society, and you can also be its leaders. I know the immense influence you can exercise upon public opinion, and I trust that you will exercise it in this noble and useful cause.

J. H.

GEOGRAPHIC LITERATURE

Cuba and Porto Rico with the Other Islands of the West Indies. Their Topography, Climate, Flora, Products, Industries, Cities, People, Political Conditions, etc. By Robert T. Hill, of the United States Geological Survey. Pp. xxviii + 429, with 2 maps and 79 plates. New York: The Century Company. 1898. $3.00.

This is one of the books of the year. It is made notable by timeliness, and still more by breadth of view and strength of grasp. The author is a well-known geologist and geographer, a leading authority on the structure and development of the Antillean region as well as Central America, Mexico, and southern United States; yet this latest publication is his magnum opus, and displays his ability to deal with scenic features, social problems, questions of statecraft, historical events, and softer literature no less efficiently than with the technical problems of his special science. The work of the publishers is equally creditable; no more tasteful and elegant specimen of book-making has ever left the De Vinne press and Century house. Most of the abundant illustrations are delicately tooled halftones, and the cover is a work of art; the lists of contents and illustrations are full, the introduction is germane, and the index is adequate. The first chapter is devoted to the geographic relations of the West Indies; the second to the West Indian waters, including submarine configuration and conditions; the third to the geographic classification of the West Indian islands; and these form an admirable summary of current knowledge, illumined and interpreted by personal observation. The fourth chapter is an original description of the Greater Antilles in terms of physical and political characters, with constant reference to natural resources and social

conditions. Then come ten chapters on the island of Cuba, depicting the physical features and the climate, flora, and fauna, describing the conditions of health and sanitation, defining the geographic subdivisions, setting forth the resources of the island and the facilities for commerce and transportation, analyzing the population, describing the cities, and discussing the future of the island. These chapters are based chiefly on first-hand knowledge, supplemented by historical and statistical research; they give a remarkably clear picture of the Pearl of the Antilles and her people, and bear inherent evidence of fair and dispassionate judgment. In discussing health and sanitation, the author departs from his customary impersonal treatment long enough to offer suggestions which every tropical traveler would do well to note. "Three rules I have followed invariably: first, to adapt my habits of dress, food, and hours of work and rest to those of the people of the country; secondly, never in any circumstances to drink a drop of native water where it could possibly be avoided, and if so always to boil it. For this purpose I have always carried an alcohol-lamp and a tin canteen, in which, when boiled water could not otherwise be obtained, I could myself attend to the matter. Twice when, in desperation after tedious exercises, I yielded to the temptation of drinking the native water unboiled, the results were almost fatal. The third rule has been never to linger around the densely crowded and unsanitary areas of cities, and always to choose a room facing on the street" (page 60). He also advises against miscellaneous eating of fruits. The chapters on the people of Cuba and the future of the island are warmed by appreciation of a kindly and hospitable folk who, despite languorous antecedents and enervating climate, have struggled long and shed their blood freely for civil liberty. Chapters fifteen to nineteen are devoted to the island of Puerto Rico, and present a clear picture of this newly acquired insular territory of the United States; then follow three chapters on Jamaica, the well-ordered island, justly considered a model British colony. The lively paragraphs, enriched by well-chosen incident, indicate that while the colony is indeed British, the white Anglo-Saxon nucleus about which the darker plasma flows is very small, and, albeit effective in governmental control, of only moderate influence in shaping the current thought of the prevailing population. "The Jamaica negroes are *sui generis;* nothing like them, even of their own race, can elsewhere be found—not even elsewhere in the West Indies" (page 227). The twenty-third chapter describes the much-named island of Santo Domingo—the designation preferred by the author if the old name "Hispaniola" must be abandoned; and a chapter is devoted to each of the two republics planted on the island. The central body of the Antillean group, this island is the most striking of all in its culminating altitude, in topographic diversity as well as in natural picturesqueness, and even more interesting in historical associations; the site of the first European colony in the New World, the place of introduction of African slavery into America, the field of frequent battle and reeking bloodshed, the scene of the dark tragedy of Toussaint l'Ouverture and site of the Black Republic, this miniature continent has played a leading rôle in the

history of several nations, as Mr Hill's pages happily show, and has given origin to two of the world's significant experiments in popular government. The subject of the twenty-sixth chapter is the Bahamas; then the Lesser Antilles—including of course storied Martinique, motherland of Josephine—and the Caribbees, the South American islands of Trinidad and Tobago and Curaçao, and last of all Barbados, are treated in nine chapters. A chapter on the geological features of the West Indies cannot fail to attract scientific geographers, while the final (thirty-seventh and thirty-eighth) chapters on race problems in the West Indies and on the future of this insular realm are worthy the scrutiny of statesmen. The scope of the book cannot better be indicated than by noting that it represents the recent observations and generalizations of a trained geographer, expressed in non-technical language; that it contains the best account extant of Cuba and its people; that it embodies the latest and largest accessible information concerning Puerto Rico; that its chapters on Jamaica form the most convenient description of that island printed on this side of the Atlantic; that its account of Santo Domingo and its two republics is the only full and trustworthy one available; and finally that the work, as a whole, is by far the most complete and useful description of the West Indies, considered collectively, issued during recent years—indeed, it is the only modern handbook of the mid-American isles, and the best source of general information concerning each of them. Members of the National Geographic Society will feel a direct interest in the book as the work of one of their number; and the interest will be the greater in that it took inception in addresses before the Society and a widely read paper in THE NATIONAL GEOGRAPHIC MAGAZINE for May last. While there are a few marks of haste in putting the material together—*e. g.*, the misspelling of the name of a surgeon-general in body and index—the volume conveys the impression of large personal acquaintance with, and of mature thought concerning, its important subject.

W J M.

Railway Economics. By H. T. Newcomb. Pp. 152. Philadelphia: Railway World Publishing Company. 1898. $1.00.

Into this exceedingly well-printed and in every way attractive volume Prof. H. T. Newcomb, whose contributions to periodical literature long ago gained for him an enviable reputation as a clear, sound, and forcible economic writer, especially on railroad subjects, has compressed an immense amount of valuable information bearing upon the transportation problem. The book is principally devoted to the development, classification, and analysis of facts concerning railroad rates and rate-making, and conclusions, except those most essential and obvious, are left to the reader. It is interesting to observe that, having approached the subject from the view-point of public interest, the author's examination of the history and present condition of railroad transportation tends unmistakably to justify the limitation of competition, which, as between railroads, he plainly regards as costly and mischievous.

J. H.

The Philippine Islands and their People. A Record of Personal Observation and Experience, with a Short Summary of the More Important Facts in the History of the Archipelago. By Dean C. Worcester, Assistant Professor of Zoölogy, University of Michigan. New York: The Macmillan Company. 1898. Pp. xix + 529, with 2 maps and many illustrations in text.

This is primarily a book of travel—incidentally one of adventure. It is enriched by an introductory chapter in which the history of the Philippines is summarized, and by an appendix of eighteen pages in which the natural resources of the islands are described in such detail as to render this part of the book a standard source of information, more comprehensive than any other now available. Professor Worcester first visited the Philippines in September, 1887, as an amateur naturalist attached to a scientific expedition; he remained eleven months, reaching fifteen of the principal islands. His second visit began in July, 1890, and extended over more than two years, during which period he remained on each of nineteen islands "long enough to get a fairly representative collection of its birds and mammals" (page x). The scientific results of his work and that of his companions (especially Dr Frank S. Bourns) have been turned over to various scientific institutions, notably the U. S. National Museum, which now has in press an elaborate report on the ornithology of the island prepared by these naturalists. The narrative of the journeys and experiences, and the observations on people and things in general, are incorporated in the book under notice. The graphic paragraphs present a succession of living pictures combining to create realistic impressions concerning the islands and their people; and, while the story is told in the first person, the unaffected language and contagious good humor of the author combine to render it attractive and easy of assimilation. Passing over fields previously untrodden by the Caucasian, as he did in different places, Professor Worcester was able to make substantial contributions to different branches of science. New water-ways were discovered and mapped, important details of topography were noted, and the distribution of plants and insects, as well as of birds, was ascertained; he was apparently the first white man to visit certain native tribes, and one of the first to see the curious and ferocious little wood buffalo, the timarau—the mythic unicorn-cyclops of the Mindoro jungles; his descriptions of the Mangyan and Tagbanua tribes are noteworthy contributions to ethnology; while his visit to the Taäl volcano of Luzon cannot fail to convey useful impressions to the geologist. The chief value of the book to serious students lies in the description of civil misrule under the so-called government, and in his accounts of the characteristics of the Filipinos. The reflections on civil affairs are evidently temperate and carefully guarded—indeed no serious criticism is uttered without reference to Foreman, whose sympathies were with the established church and state. For example, Worcester remarks of the Spanish officials, "They are expected to steal more or less. That is what they are there for, and they do not hesitate to admit it. Time and again I have heard them say of themselves, when discussing the matter, 'We are a nation of thieves'; and if I may judge from what I myself saw, much

might be said in support of this view of the case. If peculation becomes too extensive, however, so that the perquisites of those in high places are interfered with, an investigation is ordered" (page 469). But Foreman says, "If the peculations by the government employés, from the highest circles downward, could be arrested, the inhabitants of this colony would doubtless be several millions richer per annum. One is frequently hearing of officials leaving for Spain with sums far exceeding the total emoluments they have received during their term of office. Some provincial employés acquire a pernicious habit of annexing what is not theirs, by all manner of pretexts. To cite one of many instances: I knew a governor of Negros island who seldom saw a native pass the Government house with a good horse without begging it of him; thus, under fear of his avenging a refusal, his subjects furnished him little by little with a large stud, which he sold before he left, much to their disgust" (page 471). The taxes and the methods of collecting them are atrocious: The comandante of Panay "reconcentrated" his people in villages in order to facilitate the collection of taxes; and he amused himself by riding about the country and firing the houses of those who delayed gathering in the villages designated. "We one day saw him burn three native huts. He gave the inmates no warning, but in each case jumped from his horse, pulled a bunch of dry grass, lighted it and thrust it into the thatch, which burned like tinder. Those within jumped from doors and windows in their haste to escape. When a house was completely burned, he very courteously suggested that it might be well for its occupants to look for a site in town when ready to rebuild" (page 234). The same comandante had an ingenious device for bringing delinquent tax-payers to terms: "He caused them to be caught and tied to trees, and then set a large and vicious dog on to them, and encouraged it to worry them" (page 234). An equally ingenious officer armed his tax-gatherers with a sort of cat-o'-nine-tails made from vines of the bejuco, which are circled at intervals of an inch or two by rings of recurved thorns; with these bloody devices the delinquent was lassoed and dragged before the tribunal, where he was stripped to the waist, extended on a bench, and flogged methodically with a rattan which cut the skin and brought blood with each blow. "We were often forced to witness these cruel whippings during our stay. Some of the victims lay still and bore their torture in silence; others cried out, and threw themselves from the bench, with every blow. If they made too much trouble in this way, they were tied in place. After the whipping they were shut into the jail beneath the tribunal, and kept there until relatives or friends paid their debts. If there was too much delay, another whipping followed. Men sometimes died from the effects of these beatings, and women were subjected to the same inhuman treatment as men" (page 256). The bejuco itself was sometimes used for flogging, but not commonly, since the results were too often fatal. The taxes so barbarously collected were levied on almost every conceivable form of property or privilege; the annual tax for the *cedula personal*, or document of identity, varied from fifty cents to twenty-five dollars according to the supposed means of the applicant, and no person could transact business or travel without such a document; cocoanut trees were subject to an annual tax of five cents, and

a tax was required for the license to run the oil-press for extracting value from the ripe cocoanuts. The producer had to pay for a license to sell his bananas or rice or milk; the owner could not kill his buffalo or his hog for needed meat without a tax of two to four dollars; he could not even fell a tree on his own homestead without paying for the privilege. "It must be remembered that a man's wages are frequently not more than five or ten cents per day; that a large majority of the people cannot get work at any price; and that the taxes are not the whole story, for the village friar is yet to be reckoned with, and he has ways of his own for relieving his parishioners of their pence" (page 237). Sometimes the friars were kindly and generous, but so many were otherwise as to lower the average, and apparently more than nullify the occasional benefit of their presence. Their charges for marriage were so extortionate "as to give rise to a widespread and almost necessary custom of dispensing with it" (page 347); the minimum charge for burial in Masbate was fifty dollars, or seventy-five if a coffin was used (which itself was sold by the priest at a good price); one padre was not content with prohibiting the burial in holy ground of bodies whose families could not pay the charges, but "caused them to be exposed on the trees about the village square, where they were left to the tender mercies of carrion-eating birds until such time as relatives or friends compensated the holy father in advance for his services" (page 314). On the whole, it seems evident that the civil conditions in the island have been such as to check progress, to prevent industrial development, and to render miserable the lives of the people. Referring to the people themselves, Professor Worcester says: "The writers in our current literature who lump the whole population of the Philippines as barbarians and savages are grossly in error" (page 472). In addition to the Caucasians, Chinese, and a few Japanese, there are more than eighty distinct tribes, conveniently grouped as Negritos, pagan Malays, Mohammedan Malays, and civilized Malays. The Negritos "are rapidly disappearing, and seem destined to speedy extinction" (page 473); the pagan Malays comprise the important tribes of aborigines retaining primitive characteristics. Some of them are savage in disposition and are given to head-hunting and other bloodthirsty customs, though most are harmless and docile and eminently susceptible to civilization. The Mohammedan Malays, or Moro, retain divers traits of savagery, some of them intensified by the fanaticism of a barbaric religion; the most obnoxious of them are the *juramentados*, who, having taken oath to die killing Christians as the price of eternal glory, arm themselves, enter the nearest town, and run amok among the residents, slaying every living being within reach until themselves slain; but even these people yield to wise government combining justice and firmness, as shown by the success of General Arolas in dealing with them. The civilized Malays are hospitable, cheerful, fairly honest according to their lights, self-respecting, genial, and notably ready to tolerate judicious government; most of them are constitutionally indolent, though in those islands in which hard natural conditions make it difficult to earn a livelihood they are noted for their industry; yet it is not to be forgotten that they are primitive people,

without the strong hereditary character of civilized and enlightened men—*i. e.*, in the words of an observing priest, they are "big children who must be treated like little ones" (page 482). The book is rather sumptuous, printed on thick paper in large type (composed in England, judging from the laboured orthography), supplied with a good map, and illustrated with excellent halftone reproductions of the author's photographs.

W J M.

Volcanoes of North America: A Reading Lesson for Students of Geography and Geology. By Israel C. Russell, Professor of Geology in the University of Michigan, etc. Pp. xiv + 346, with maps and illustrations. New York: The Macmillan Company. 1897. $4.00.

It is gratifying to note that after many years of ultra-specialization a geologist and geographer has undertaken the task of summing up the knowledge of the broader features of our continent. In this work Professor Russell has presented a summary of the distribution of the volcanoes, living and extinct, of the North American continent, and has succeeded in producing a readable and admirable volume. The first quarter of the book is devoted to a discussion of the characteristics of volcanoes in general, dealing with the types of volcanic eruptions, the nature of the ejecta, the life history of eruptions, the geomorphology of volcanic forms, subterranean intrusions of igneous rocks, and classification of igneous rocks based upon mineral characters. While these subjects are ably treated by Professor Russell and would well become a text book of geology, we cannot but begrudge the valuable space they occupy, which later necessitated a condensation of his descriptions of the volcanoes themselves. It is also regrettable that the author, in illustrating the character of volcanic action, should have used so many foreign examples, when abundant material could be found at home. He need not have gone outside of North America and the adjacent Hawaiian and West India islands to have found illustrations of every known type of volcanic activity and productivity. We doubt if even the explosion of Krakatoa itself, which the author so freely cites, much exceeded in wide-reaching effect the tremendous catastrophe of Morne Garon, St Vincent, in 1812, which affected American geography from Chili to New Madrid, destroying many cities, notably Caracas. In the mud craterlets of the Sonoran coastal deserts, the frequently active Colima of southern Mexico, the numerous active volcanoes of Central America, and the volcanoes of the Aleutian and Hawaiian islands, the author could have found abundant illustrations of all known volcanic phenomena.

Following the geological introduction is a compendium of the distribution of volcanoes of North America, active and recent, which is the best that has ever been presented. This is most instructive reading and will be exceedingly useful to the future student who will take up this subject and pursue it more extensively, for there is no more tempting or more profitable field for research on the part of some one who has means and opportunity than a systematic exploration and description of the North American volcanoes, especially those of Mexico and Central America and the Caribbee islands.

Into 38 pages the author crowds a valuable compilation of the known facts concerning the Central American volcanoes, 64 of which are enumerated. Only 18 pages are given to the volcanoes of Mexico, including those wonderful giants of the New World, Popocatapetl, Ixtaccihuatl, Xinantecatl, Tuxtla, Perote, etc., which lie almost at our very doors, and are so accessible to all who are in search of knowledge. It seems somewhat disproportionate, after so briefly describing the sites of greatest North American volcanic development, that 90 pages should be given to the relatively trivial and mostly prehistoric volcanic phenomena of the United States; but when we consider that these are here more fully and comprehensively presented than hitherto attempted, we feel grateful to the author and overlook his brief consideration of the more typical North American volcanic areas. It would have been well had Professor Russell included on his map and in his text some mention of the latter, which stretch across the eastern gateway of the American Mediterranean, and of the volcanic cinder cones, perhaps the most perfect in the United States, occurring east of the Rio Grande in New Mexico; and since he included dead volcanoes, also the stocks of southwestern Texas, the only ones of the kind, so far as we are aware, occurring within the Southern Atlantic Coastal plain of the United States.

As a whole, Professor Russell's work is thoroughly commendable and will not only prove a welcome addition to the library of those scientifically inclined, but will accomplish much in the laudable direction of placing within the hands of the layman a most readable treatise upon a technical subject.

R. T. H.

PROCEEDINGS OF THE NATIONAL GEOGRAPHIC SOCIETY, SESSION 1898–'99

Regular Meeting, November 4, 1898.—Col. Henry F. Blount in the chair. Lieut. D. H. Jarvis, U. S. Revenue Cutter Service, gave an account of the Point Barrow Relief Expedition, winter of 1897–'98, illustrating his remarks by lantern slides.

Regular Meeting, November 18, 1898.—Mr W J McGee in the chair. Prof. Robert T. Hill delivered an address on Cuba and Its People, illustrating his remarks by lantern slides showing the architecture, manufacturing establishments, mode of travel, scenery, and types of inhabitants of the island.

Special Meeting, November 25, 1898.—Mr W J McGee in the chair. Chief Engineer Harrie Webster, U. S. Navy, gave an illustrated lecture on Korea.

Regular Meeting, December 2, 1898.—Mr W J McGee in the chair. Prof. W. Edwin Priest, Central High School, Washington, D. C., gave an illustrated lecture on the Spanish in Europe and America.

At the conclusion of the lecture an informal reception was given to

members of the Cuban delegation, the receiving party consisting of General José Miguel Gomez, Colonel Manuel Sanguily, Dr Jose A. Gonzales Lanuza, Señor Quesada, and Señor Ricardo Diaz-Albertini.

ELECTIONS.—New members have been elected as follows:

September 14, 1898.—Mrs Emma Shaw Colcleugh, Porter Graves, Miss Belle H. Stone.

October 7.—Miss Mabel L. Allen, Floyd N. Barber, Miss Etta Blowers, William S. Campbell, Charles R. Dean, Jerome F. Johnson, Henry Landes, Miss Sarah M. Lilley, Miss Kate Marsden, F. F. Murdock, Mrs Ellen S. Mussey, Samuel Hubbard, C. N. Osgood, Walter S. Parker, Miss Louise C. Patterson, R. B. Tuley, Rev. John D. Whitney, Major Edmund Wilkes.

October 21.—Miss Laura A. Colbath, Miss Maude Fierce, Mrs J. Ellen Foster, W. C. Haldeman, C. Munro Hall, Frederic H. Holmes, William T Horine, Major Jed Hotchkiss (life), A. J. Knowlton, Miss Harriett B. Sargent, Mrs Helen M. Wilcox.

November 10.—Mrs M. F. Adams, Miss Belle Allen, Rev. Henry Baker, George F. Bird, Dr J. H. Clark, U. S. N.; Prof. John L. Ewell, Miss Elizabeth S. Hungerford, Homer M. Kintz, Lieut. Francis A. Levis, U. S. R. C. S.; Le Duc de Loubat (F. Loubat), life, F. W. McReynolds, J. Oliver Moque, Dr Nora Moyer, J. H. Ralston, Dr Eugene C. Rice, Dr Thomas E. Ridgway, Miss Helen Frances Shedd, W. H. Singleton, Mrs Elizabeth C. Sloan, J. Henry Smith, Dr William H. Spencer, Lieut. John W. Stewart, U. S. N.; Dr William A. Stewart, Miss Alice B. Train, Alexander G. Uptegraff, M. A. Winter, D. W. Woods.

November 18.—Willard Abbott, William J. Acker, Mrs F. E. Bach, Edwin C. Clark, Randolph D. Hopkins, Mrs Clara K. Ingersoll, Bernard H. Lane, Dr Hanson T. A. Lemon, Miss K. L. Patterson, Electus A. Pratt, Dr William Seaton, W. H. Tapley, Charles W. Taylor, Waldo B. Truesdell, George Westinghouse, Jr. (life).

Upon nomination by Prof. W J McGee, William McKinley, President of the United States, was elected an honorary member.

December 2, 1898.—Miss May W. Cameron, J. B. Collins, Mrs Carrie R. Cox, Mrs Charlotte E. Danforth, Ernest P. Goodrich, Miss Annie Grey, Alfred Holmead, Miss A. S. Mallett, Francois E. Matthies, Mrs S. W. McCall, E. Meade, Hon. F. W. Mondell, Miss Elvira G. Parker, Miss Katherine Raber, Major Henry Romeyn, U. S. A., Frank R. Rutter, Ph D., Norman E. Webster, Jr., Mrs John T. Wood.

Elections to fill vacancies on Board of Managers:

October 21.—Prof. Willis L. Moore, Chief of the U. S. Weather Bureau, was elected a member of the Board of Managers to fill the unexpired term of Lieut. Everett Hayden, U. S. N., removed from the city and transferred, at his own request, to corresponding membership.

November 18.—Prof. Henry S. Pritchett, Superintendent of the U. S. Coast and Geodetic Survey, was elected a member of the Board of Managers to fill the unexpired term of Prof. G. K. Gilbert, resigned.

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ERRATA

Page 108, line 1, for "George C. Davidson" *read* George Davidson.
Page 467, line 23, for "half" *read* quarter.
Page 472, line 21, for "Vineyard" *read* Nantucket.

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